

REMARKS

The final Office Action of April 20, 2007, has been received and reviewed.

Claims 1-25 are currently pending and under consideration in the above-referenced application, each standing rejected.

Reconsideration of the above-referenced application is respectfully requested.

Rejections under 35 U.S.C. § 102

Claims 1-11 and 15-19 have been rejected under 35 U.S.C. § 102(e) for being drawn to subject matter that is purportedly anticipated by the subject matter described in U.S. Patent 5,972,792 to Hudson (hereinafter "Hudson").

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single reference which qualifies as prior art under 35 U.S.C. § 102. *Verdegaal Brothers v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). The identical invention must be shown in as complete detail as is contained in the claim. *Richardson v. Suzuki Motor Co.*, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

With respect to inherency, M.P.E.P. § 2112 provides:

The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish inherency of that result or characteristic. *In re Rijckaert*, 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993) . . . 'To establish inherency, the extrinsic evidence 'must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill . . . ' *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1991).

Independent claim 1 recites a substantially abrasive-free slurry for use in polishing a copper structure of a semiconductor device. The slurry is formulated to substantially concurrently polish copper and a barrier material with the barrier material being removed at substantially the same rate as or at a slower rate than copper is removed.

Hudson discloses abrasive-free slurries that are useful with fixed-abrasive polishing pads. The slurries of Hudson are useful for planarizing films that have been formed from a variety of

materials (*see, e.g.*, col. 22-25), such as copper. Col. 4, lines 50-52. The slurries that are described in Hudson may fall within a broad range of pH values (less than 2.5, 3.0 to 10.0, more than 10.5; col. 4, lines 53-54 and 58-59), include a number of different types of oxidants, and include other components in amounts that fall within broad ranges. More specifically, Hudson describes that abrasive-free slurries that are formulated to polish copper:

preferably ha[ve] a pH of less than approximately 2.5 or more than approximately 10.5, and ha[ve] one of the following mixtures:
deionized water with 0.1%-5.0% nitric acid and 0.1%-10.0% ethanol; deionized water with 0.1%-5.0% nitric acid and 0.1%-1.0% benzotriazole; deionized water with 0.5%-3.0% ammonium hydroxide; or deionized water with 0.5%-3.0% ammonia ferriicyanide. Col. 4, lines 54-65.

Hudson describes slurries that selectively oxidize conductive material without oxidizing or removing insulating material. Col. 5, lines 46-54.

It is respectfully submitted that Hudson does not expressly or inherently describe a slurry that is formulated to substantially concurrently polish copper and a barrier material, with the barrier material being removed at substantially the same rate as or at a slower rate than copper is removed. Rather, Hudson describes a slurry that is formulated to remove material from the surface of a wafer. *See* Hudson, col. 6, lines 48-61. Because the description of Hudson is limited to slurries that oxidize conductive material without damaging an insulating material, Hudson does not anticipate each and every element of independent claim 1.

Furthermore, it is respectfully submitted that the vague disclosure of a copper-polishing slurry provided by Hudson could not be considered to amount to an express or inherent description of a slurry that is formulated to substantially concurrently polish copper and a barrier material, with the barrier material being removed at substantially the same rate as or at a slower rate than copper is removed.

In this regard, M.P.E.P. § 2131.03 provides:

In order to anticipate the claims, the claimed subject matter must be disclosed in the reference with "sufficient specificity to constitute an anticipation under the statute." What constitutes a "sufficient specificity" is fact dependent. . . . [i]f the reference teaches a broad range, . . . depending on the other factors of the

case, it may be reasonable to conclude that the [claimed invention] is not disclosed with “sufficient specificity” to constitute an anticipation of the claims. M.P.E.P. § 2131.03 (citing *Atofina v. Great Lakes Chem. Corp.*, 441 F.3d 991, 999, 78 USPQ2d 1417, 1423 (Fed. Cir. 2006)).

While Hudson may describe slurries that might be useful in polishing copper, Hudson does not describe, with “sufficient specificity,” a copper-polishing slurry that meets the requirements of independent claim 1. In particular, Hudson does not provide any specific combination of slurry components or any specific slurry formulation, including relative amounts of the various components of the slurry, that would necessarily meet the requirements of independent claim 1. Therefore, Hudson’s disclosure lacks the “sufficient specificity” required by the law.

The lack of an express or inherent description by Hudson is further evident from the prior art, in which slurries that are formulated to remove copper are generally incapable of removing barrier materials at about the same rate as or a slower than copper is removed. From the prior art, including that discussed in the “BACKGROUND” section of the above-referenced application, the slurry of Hudson would not necessarily remove a barrier material at substantially the same rate as or a slower rate than copper is removed.

The Examiner asserts that “using Hudson’s slurry in the same manner as claimed would inherently result in the slurry being formulated to substantially concurrently polish copper and a barrier material with the barrier material being removed at substantially the same rate as or at a slower rate than copper is removed...” See Office Action, page 3.

It is respectfully submitted that the slurry formulations mentioned in Hudson would not necessarily, or inherently, result in a slurry that substantially concurrently polishes both copper and a barrier material with the barrier material being removed at substantially the same rate as or at a slower rate than copper is removed.

Therefore, it is respectfully submitted that Hudson does not expressly or inherently describe any slurry with “sufficient specificity” to anticipate each and every element of independent claim 1. Thus, under 35 U.S.C. § 102(a), the subject matter recited in independent claim 1 is allowable over the disclosure of Hudson.

Each of claims 2-11 and 15-19 is allowable, among other reasons, for depending either directly or indirectly from independent claim 1, which is allowable.

Claim 2 is also allowable since Hudson provides no express or inherent description of a slurry that is formulated for use with a polishing pad that includes fixed aluminum dioxide, titanium dioxide, silicon dioxide, or cerium dioxide abrasive particles.

Claim 3 is additionally allowable since Hudson neither expressly nor inherently describes a slurry that is formulated to oxidize copper at substantially the same rate as or at a faster rate than a barrier material is oxidized.

Claim 4 is further allowable because Hudson does not expressly or inherently describe a slurry in which copper and a barrier material have substantially the same oxidation energies.

Claim 5 depends from claim 4 and is also allowable since Hudson includes no express or inherent description of a slurry in which a barrier material has an oxidation energy of about 0.25 V more to about 0.20 V less than an oxidation energy of copper.

Claim 6 is further allowable since Hudson lacks any express or inherent description of a slurry in which a rate of removal of a barrier material is up to about ten times slower than a rate of removal of copper.

Claim 7 is additionally allowable because Hudson includes no express or inherent description of a slurry in which a rate of removal of a barrier material is about two to about four times slower than a rate of removal of copper.

Claim 8 is also allowable since Hudson neither expressly nor inherently describes a slurry that is formulated to remove copper and a barrier material without substantially dissolving barrier material that underlies remaining portions of copper.

Withdrawal of the 35 U.S.C. § 102(a) rejections of claims 1-11 and 15-19 is respectfully solicited, as is the allowance of each of these claims.

Rejections under 35 U.S.C. § 103(a)

Claims 12-14 and 20-25 stand rejected under 35 U.S.C. § 103(a).

The standard for establishing and maintaining a rejection under 35 U.S.C. § 103(a) is set forth in M.P.E.P. § 706.02(j), which provides:

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Hudson in View of Nakazato

Claims 12-14 and 21-25 stand rejected under 35 U.S.C. § 103(a) for reciting subject matter which is assertedly unpatentable over that taught in Hudson as applied to claim 1 above, and further in view of teachings from U.S. Patent 4,459,216 to Nakazato et al. (hereinafter "Nakazato").

Claims 12-14 and 21-25 are each allowable, among other reasons, for depending directly or indirectly from claim 1, which is allowable.

Moreover, it is respectfully submitted that Hudson teaches away from dissolving conductive material while oxidizing and polishing the same. Col. 4, lines 1-19, and col. 5, lines 55-64. In contrast, Nakazato teaches that "[a]n object of the present invention is to provide a chemical dissolving solution having a good dissolving capacity for various kinds of metal." Col. 2, lines 33-35. In this regard, the mere fact that Nakazato supplies teachings that are missing from Hudson is insufficient to overcome the fact that Hudson teaches away from the asserted combination. As Hudson teaches away from the asserted combination of its teachings

with those of Nakazato, it is respectfully submitted that one of ordinary skill in the art wouldn't have been motivated to combine the teachings of these references in the asserted manner.

Therefore, a *prima facie* case of obviousness has not been established against any of claims 12-14 and 21-25 under 35 U.S.C. § 103(a).

Hudson in View of Suzuki

Claim 20 stands rejected under 35 U.S.C. § 103(a) for reciting subject matter which is allegedly unpatentable over the subject matter taught in Hudson and, further, in view of teachings from U.S. Patent 5,885,334 to Suzuki et al. (hereinafter "Suzuki").

Claim 20 is allowable, among other reasons, for depending indirectly from claim 1, which is allowable.

It is respectfully requested that the 35 U.S.C. § 103(a) rejections of claims 12-14 and 20-25 be withdrawn, and that each of these claims be allowed.

CONCLUSION

It is respectfully submitted that each of claims 1-25 is allowable. An early notice of the allowability of each of these claims is respectfully solicited, as is an indication that the above-referenced application has been passed for issuance. If any issues preventing allowance of the above-referenced application remain which might be resolved by way of a telephone conference, the Office is kindly invited to contact the undersigned attorney.

Respectfully submitted,



Tracey Harrach
Registration No. 57,764
Attorney for Applicants
TRASKBRITT, PC
P.O. Box 2550
Salt Lake City, Utah 84110-2550
Telephone: 801-532-1922

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